

REMARKS

Claim 19 is amended, claims 1-18 and 25-50 were canceled in one or more previous responses, and claim 89 is added; as a result, claims 19-24 and 51-89 are now pending in this application.

No new subject matter has been added through the amendments to claim 19. Support for the amendments to claim 19 can be found throughout the specification, including but not limited to the specification at page 10, line 9 through page 11, line 22, and in FIGs. 4-6.

No new subject matter has been added through new claim 89. Support for the subject matter of new claim 89 can be found throughout the specification, including but not limited to the specification at page 10, lines 9-27 and in FIG. 4.

Previous Election

Applicant stated the following in a previously filed response:¹

Election

At Office Action page 2, claims 62-88 are withdrawn based on election by original presentation. Applicant respectfully traverses. The Office Action provides no basis for such an election. The Office Action states the standard but provides no reasons for the withdrawal. Specifically, the Office Action states “Newly submitted claims 62-88 are directed to an invention that is independent or distinct from the invention originally claimed (claims 19-24 and 51-61)” and cites MPEP § 821.03. However, MPEP § 821.03 sets forth the standard paragraph for use in this instance, which requires a reason, as follows: “Newly submitted claim [1] directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: [2].” The analysis required for independent and distinct is not present. Accordingly, applicant submits that a *prima facie* case of election by original presentation has not been made. Consideration of all pending claims is requested.

¹ See Applicant's response at page 8 mailed January 17, 2007 in response to an Office Action mailed October 20, 2007 in this application.

Applicant's representatives fail to find in the now pending Final Office Action any further reply to Applicant's above arguments regarding claims 62-88. Applicant maintains the above stated arguments with respect to claims 62-88, and respectfully requests that claims 62-88 be considered, and that an indication of allowance for claims 62-88 be included in the next official communication from the Examiner in this application.

§103 Rejection of the Claims

Claims 19, 21-24, 51-54, 56-58, 60-61 and 88.

Claims 19, 21-24, 51-54, 56-58, 60-61 and 88 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gillespie (U.S. 5,898,858) in view of Capote et al. (U.S. 6,121,689) and Gilleo (U.S. 6,265,776).

Applicable Law

In rejecting claims under 35 U.S.C. §103, the examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. See M.P.E.P. §2142.

In the recent decision of the Supreme Court on *KSR Int'l Co. v. Teleflex Inc.*², the analysis of obviousness previously set forth in *Graham v. John Deere Co. of Kansas City*³, was reaffirmed. The Court in *Graham* set out an objective analysis for applying §103 as follows:

“Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined.”⁴

When claim elements are found in more than one prior art reference, the fact finder must determine “whether a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims.” *In re Kahn*⁵. In so doing,

² 127 S.Ct. 1727, 82 USPQ2d 1385 (2007).

³ 383 U.S. 1, 17, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966).

⁴ The Court in *KSR v. Teleflex*, at page 1730, quoted the analysis of *Graham* from page 18.

⁵ 441 F.3d 977, 988, 78 USPQ2d 1329, 1337 (Fed. Cir. 2006).

the Examiner must make the factual determinations set forth in *Graham v. John Deere Co. of Kansas City*⁶.

Further, to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*⁷. "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*⁸. Office personnel must rely on the applicant's disclosure to properly determine the meaning of the claims. *Markman v. Westview Instruments*⁹.

The Final Office Action fails to state a prima facie case of obviousness with respect to claims 19, 21-24, 51-54, 56-58, 60-6, 1 and 88 because the Final Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo.

As noted above, the Final Office Action has the burden to provide a *prima facie* showing of obviousness, including a showing of how a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims."

In an attempt to meet these requirements, the Final Office Action on page 3 states,

Therefore, it would have been obvious to one having ordinary [sic] in the art at the time the invention was made to have an adhesive layer covering the chip and having an array of opening aligned with connection pads having a chamfer and a conductive material substantially filling the array of openings as taught by Capote et al. and Gilleo into the device in Gillespie in order to provide a flip chip configuration without bending the chip and substrate and form the contact angles at the interface between the flux coating and the underfill layer.

Applicant respectfully disagrees with these statements, and further submits that statements within Gillespie, Capote et al., and Gilleo themselves teach away from making the proposed combination as suggested by the Final Office Action. Further, neither the documents

⁶ 383 U.S. 1 at 467.

⁷ 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

⁸ 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

⁹ 52 F.3d 967, 980, 34 USPQ2d 1321, 1330 (Fed. Cir.) (*en banc*), *aff'd*, U.S., 116 S. Ct. 1384 (1996).

themselves, nor any other evidence of record in the Final Office Action, provide a showing of how a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims in view of Gillespie, Capote et al., and Gilleo. Without such support, the Final Office Action fails to meet the requirements as quoted above for forming the proposed combination of Gillespie, Capote et al., and Gilleo, and thus is attempting to combine the teachings of Gillespie, Capote et al. and Gilleo based on Applicant's disclosure using impermissible hindsight.

In support of these arguments, Applicant directs attention to Capote et al., which states,¹⁰

In yet another embodiment (FIG. 5), the circuitry on the bottom surface 16 of the chip 10 is coated with the encapsulant 22 then the contact pads 24 are exposed by making vias 28 through the encapsulant 22 (e.g., either with a laser, plasma, chemical etching, a drill or by photo-imaging and development or any other method known to one skilled in the art) (FIG. 6). The vias 28 within the encapsulant 22 are then filled with solder 30 (FIG. 7) or a conductive adhesive as described in U.S. Pat. No. 5,376,403 which is forced into the holes by solder injection molding, solder jetting, screen printing, or other methods known to those skilled in the art.

Thus, Capote et al. makes vias through an encapsulant, and then fills the vias with solder. There is no solder present, and no mention in Capote et al. of solder or flux at the time the vias are formed in the encapsulant. In contrast to this process, Gilleo relies on the presence of flux (and solder balls) as already being present when the underfill material is added in order to deposit the underfill on the wafer in spaces between the solder bumps,¹¹ wherein Gilleo further states,¹²

Since the materials are selected such that the flux liquid has a higher surface energy than the flux coating, a receding contact angle results at the interface between the flux coating 16, the underfill 18, and the surrounding air. This is shown at region 15 of FIG. 4.

¹⁰ See Capote et al. at column 8, lines 52-63.

¹¹ See Gilleo at column 7, lines 58-61.

¹² See Gilleo et al. column 7, line 66 through column 8, line 4.

Thus, Gilleo requires that the flux coating be present when the underfill material is added in order to create the receding contact angle. Therefore, Gilleo teaches away for a process wherein the vias would be formed *before the solder is added*, as is described in Capote et al. Further, as noted above, Capote does not discuss a flux coating, and no flux coating is shown in FIG. 6 or in FIG. 7 of Capote et al., the figures on which the Final Office Action relies on in making this rejection. As noted above, the vias in Capote et al. are formed *before the solder is even added*, so Capote et al. cannot rely on the solder, or any flux, to determine the shape of the vias in Capote et al. Thus, there is no explanation of how the proposed combination is suggested, or would even work, as proposed in the Final Office Action. Thus, there is no showing, and in fact there is a teaching away from a showing, of how one of ordinary skill in the art would have been led to make the proposed combination of Gillespie, Capote et al., Gilleo as suggested in the Final Office Action.

Because the descriptions in Capote et al. and Gilleo themselves teach away for making the proposed combination as suggested in the Final Office Action, the Final Office Action fails to meet its initial burden of factually supporting any *prima facie* conclusion of obviousness with respect to the rejection of claims 19, 21-24, 51-54, 56-58, 60-61 and 88.

Claims 19, 21-24, 51-54, 56-58, 60-61, and 88 are not obvious in view of the proposed combination of Gillespie, Capote et al., and Gilleo because the proposed combination of Gillespie, Capote et al., and Gilleo fails to disclose or suggest all of the subject matter included in claims 19, 21-24, 51-54, 56-58, 60-61, and 88

Claims 19, 21-24, 51-54, 56-58, 60-61, and 88 are not obvious in view of the proposed combination¹³ of Gillespie, Capote et al., and Gilleo because the proposed combination fails to disclose or suggest all of the subject matter included in independent claim 19, and in claims 21-24, 51-54, 56-58, 60-61, and 88 that depend from independent claim 19. As an illustration (but not limited to this illustration) of subject matter included in claims 19, 21-24, 51-54, 56-58, 60-61, and 88 and not disclosed or suggested by the proposed combination of Gillespie, Capote et al., and Gilleo independent claim 19 as amended includes,

an adhesive layer covering the first side of the first
semiconductor device with a first surface of the adhesive layer

¹³ Applicant does not admit or agree that any combination of Gillespie, Capote et al., and Gilleo can be made.

contacting the first side, the adhesive layer having an array of column-shaped openings substantially aligned with one or more connection pads of the first array of connection pads and having a chamfer in the adhesive layer opposite the first surface of the adhesive layer at a second surface of the adhesive layer at each of the column-shaped openings; and

at least one of the array of column-shaped openings includes a conductive material forming a conductive column within the at least one column-shaped opening, the conductive material in direct contact with the adhesive layer up to the chamfer within the column shaped opening.

The Final Office Action on page 2 admits, “Gillespie does not explicitly disclose the chip package includes an adhesive layer covering the chip and having an array of openings aligned with connection pads having a chamfer opposite the first surface of the adhesive layer at each of the openings and a conductive material substantially filling the array of openings.”

The additional documents Capote et al. and Gilleo fail to remedy the deficiencies of Gillespie. In contrast to independent claim 19, Capote et al. fails to disclose or suggest the subject matter included in independent claim 19, including but not limited to having, "a chamfer in the adhesive layer opposite the first surface of the adhesive layer at a second surface of the adhesive layer at each of the column-shaped openings," as included in independent claim 19.

Further, there is no teaching or suggestion in Capote et al. of, "at least one of the array of column-shaped openings includes a conductive material forming a conductive column within the at least one column-shaped opening, the conductive material in direct contact with the adhesive layer **up to the chamfer** within the column shaped opening," as included in independent claim 19. (Emphasis added).

In addition, there is no disclosure or suggestion in Gilleo of this subject matter as included in independent claim 19 and missing from Gillespie and Capote et al. In contrast to independent claim 19, Gilleo recites,¹⁴

After the solder bumps 14 have been provided with a flux coating 16, **the spaces on the wafer surface between the solder bumps 14 are provided with an underfill** in the liquid phase. The liquid underfill is applied to the wafer by spin coating, screen printing, or any of the common methods for applying liquids to surfaces. The

¹⁴ See Gilleo at column 7, line 52 through column 8, line 3.

resulting device is depicted in FIG. 4. Specifically, **FIG. 4 shows a wafer 12 having solder bumps 14 each having a flux coating 16. The underfill material 18 is deposited on the wafer 12 in the spaces between the solder bumps 14.** Since the flux coating 16 has a low surface energy, the underfill 18 does not become a coating over the flux 16. This is because surface chemistry principles require that wetting will only occur if the surface energy of the liquid (i.e., the underfill 18) is lower than that of the solid surface (i.e., the flux coating 16). Since the materials are selected such that the flux liquid has a higher surface energy than the flux coating, **a receding contact angle results at the interface between the flux coating 16, the underfill 18, and the surrounding air. (Emphasis added).**

Thus, Gilleo discloses underfill material is deposited on the wafer in the spaces between the solder bumps, and Gilleo states that the underfill merely fills the spaces between solder bumps. Underfill is not described in Gilleo as being *an adhesive layer*, and therefore Gilleo fails to disclose or suggest "a chamfer in the adhesive layer opposite the first surface of the adhesive layer at a second surface of the adhesive layer at each of the column-shaped openings," as included in independent claim 19. The Final Office action fails to provide any evidence of record indicting how the underfill layer of Gilleo is an adhesive layer as included in independent claim 19. Thus, neither the Final Office Action, or any other evidence of record, discloses or suggests, "a chamfer opposite the first surface **of the adhesive layer** at a second surface of the adhesive layer at each of the column-shaped openings," as included in independent claim 19. (Emphasis added).

Further, as noted above, Gilleo concerns "... solder bumps 14 each having a flux coating 16. The underfill material 18 is deposited on the wafer 12 in the spaces between the solder bumps 14."¹⁵ However, there is no disclosure or suggestion in Gilleo of "at least one of the array of column-shaped openings includes a conductive material forming a conductive column within the at least one column-shaped opening, the conductive material in direct contact with the adhesive layer up to the chamfer within the column shaped opening," as included in independent claim 19.

¹⁵ See Gilleo at column 7, line 58-61.

For at least the reason stated above, the proposed combination of Gillespie, Capote et al., and Gilleo fails to disclose or suggest all of the subject matter included in independent claim 19, and so independent claim 19 is not obvious in view of the proposed combination of Gillespie, Capote et al., and Gilleo.

Claims 21-24, 51-54, 56-58, 60-61, and 88 depend from independent claim 19, and so include all of the subject matter included in independent claim 19, and more. For at least the reasons stated above with respect to the independent claim 19, the proposed combination of Gillespie, Capote et al., and Gilleo fails to disclose or suggest all of the subject matter included claims 21-24, 51-54, 56-58, 60-61, and 88. Therefore, claims 21-24, 51-54, 56-58, 60-61, and 88 are patentable over the proposed combination of Gillespie, Capote et al., and Gilleo.

In addition, claims 21-24, 51-54, 56-58, 60-61 and 88 include additional subject matter that is not disclosed or suggested by the proposed combination of Gillespie, Capote et al., and Gilleo. By way of illustration, claim 88 includes,

The electronic system of claim 19, wherein the conductive material and the adhesive layer **are free from an underfill.** (Emphasis added)

As noted above, independent claim 19, from which claim 88 depends, includes, "a chamfer in the adhesive layer. . . the conductive material in direct contact with the adhesive layer up to the chamfer within the column shaped opening." The additional subject matter of claim 88 includes, "wherein the conductive material and the adhesive layer are free from an underfill." Since Gilleo only concerns an underfill, Gilleo cannot disclose or suggest a chamfer in the adhesive layer, and further cannot disclose or suggest, "the conductive material in direct contact with the adhesive layer up to the chamfer within the column shaped opening," and "wherein the conductive material and the adhesive layer are free from an underfill," all as included in claim 88. Therefore, the proposed combination of Gillespie, Capote et al., and Gilleo fails to disclose or suggest at least this subject matter as included in claim 88.

Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 19, 21-24, 51-54, 56-58, 60-61, and 88, and allowance of claims 19, 21-24, 51-54, 56-58, 60-61, and 88.

Claims 20, 55 and 59.

Claims 20, 55, and 59 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gillespie in view of Capote et al. and Gilleo as applied to claim 19 above, and further in view of Toyosawa et al. (U.S. 6,337,257).

Applicant believes they have established that the Final Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al. and Gilleo. In rejecting claims 20, 55, and 59, the Final Office Action provides no additional support for forming this proposed combination of Gillespie, Capote et al., and Gilleo. Thus, for at least the reasons stated above, the Final Office Action fails to meet the requirements for forming the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al.

By failing to meet the requirements for forming the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al., the Final Office Action fails to meet its initial burden of factually supporting any *prima facie* conclusion of obviousness with respect to the rejection of claims 20, 55, and 59.

Also as stated above, Applicant submits that the proposed combination of Gillespie, Capote et al., and Gilleo fails to disclose or suggest all of the subject matter included in independent claim 19. Additionally, the Final Office Action fails to point out, and Applicant's representatives fail to find in Toyosawa et al., a disclosure or suggestion of the subject matter included in independent claim 19 and missing from the proposed combination of Gillespie, Capote et al., and Gilleo. Thus, the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al. also fails to disclose or suggest all of the subject matter included in independent claim 19.

Claims 20, 55, and 59, directly or indirectly, depend from independent claim 19, and therefore include all of the subject matter included in independent claim 19, and more. Thus, the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al. fails to disclose or suggest all of the subject matter included in claims 20, 55, and 59, and so claims 20, 55, and 59 are not obvious in view of the proposed combination of Gillespie, Capote et al., Gilleo, and Toyosawa et al.

For at least the reasons stated above, Applicant respectfully requests reconsideration and withdrawal of the rejection, and allowance of claims 20, 55, and 59.

New claim

New claim 89 depends from independent claim 19, and includes,

The electronic system of claim 19, further including the conductive column having a head exposed through the column-shaped opening, the head recessed below the second surface of the adhesive layer.

Applicant respectfully submits that the neither Gillespie, Capote et al., Gilleo, nor Toyosawa et al., when consider either alone or in any combination¹⁶ disclose or suggest the subject matter as included in claim 89. Therefore, claim 89 is not obvious in view of any combination of the documents cited in the Final Office Action.

Applicant respectfully requests an indication in the next official communication from the Examiner in this application that claim 89 is allowed.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all

¹⁶ Again, Applicant does not admit or agree that any combination of Gillespie, Capote et al., Gilleo, or Toyosawa are possible.

rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.


Respectfully submitted,
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25 June '07
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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: MS AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 25th day of June, 2007.

Robert B. Madden

Name


Signature